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As a rule, bibliographical works, though valuable, are uninteresting. The publication which we are reviewing is an exception to the general rule; it is interesting as well as valuable. Every college and school library ought to possess a copy of it. The author aims not only to catalogue the arithmetics in Mr. Plimpton's library that were published before 1601 and give a brief statement of their contents, but to supplement this by the titles of other arithmetics known to have been printed during that period. Altogether not less than 500 publications are given, a number which swells to 1,200, if the various editions of each publication are counted. In addition to this a large number of manuscripts, some belonging to the thirteenth century, are catalogued and described. Perhaps no period in the history of arithmetic is more important than the fifteenth and sixteenth centuries, when printed works came to be widely used and when different methods of reckoning were struggling for supremacy.

What makes this book specially interesting are the numerous photographs of the title-pages, and of other pages exhibiting the notation and methods of computation in arithmetic, in vogue four or five centuries ago. The reader has before him in photographic reproduction the old scratch methods of multiplication and division, the beginnings of decimal fractions, documents showing the probable origin of the + and - signs, drawings explaining various kinds of finger symbolism and many other points of interest to teachers and students of arithmetic.

In America few researches have been carried on in the history of mathematics. One needs only examine the volumes of the *Bibliotheca Mathematica*, a journal devoted to the history of mathematics, to realize the dearth of American productive scholarship in this field. With this fact in view it is a pleasure to note that the above publication is one of value and importance, when measured by European standards. Sixty years ago De Morgan's "Arithmetical Books" was the best authority on arithmetical bibliography. Later much work in this line was done on the European continent. Now Professor Smith's "Rara Arith-

metica" takes first rank. Professor Smith has enjoyed unusual facilities for the preparation of this work. The Plimpton collection of fifteenth and sixteenth century arithmetics, in New York City, the largest collection of this kind that has ever been made, lay at his disposal. He has labored assiduously and with care. Here and there we might have wished to have seen a still wider range of topics selected for photographic exhibition; in one or two instances a greater watchfulness for the historically vital points in books might have been desired. But these are minor blemishes. The work as a whole takes first place as a bibliography of early printed arithmetics.

FLORIAN CAJORI

*Thought and Things or Genetic Logic.*¹ Vol. II., *Experimental Logic*. JAMES MARK BALDWIN. London, Swan Sonnenschein & Co.; New York, The Macmillan Company. 1908. Pp. xv + 436.

This is the second of three volumes on a subject never before so comprehensively treated by an American author. The title of the present volume has been in use for some time, but the treatment is peculiar. The genetic method of tracing out the various steps and stages in the embodiment of belief is more consistently followed here than, I think, in any well-known treatise on logic. Great praise is due the work for this and for many interesting and illuminating points in the discussion. The general problem of the work is logic from the knower's point of view, not logic from the point of view of the outside psychologist or logician who looks on and analyzes. The theme itself as conceived by Baldwin presupposes a difference between these two types of logic: it presupposes that knowledge and the knowing process have for the knower characters which they do not have for the "outsider." Knowing, for the knower, involves continual reference, according to Baldwin, to similar knowing processes dealing with the same material and going on actually or possibly in other minds; it involves, in

¹The entire work is appearing simultaneously in French, German and English. It includes a fair index to volumes one and two, and three appendices.

other words, community as a fundamental characteristic like quality, quantity, modality and relation. It also involves continual reference to the external control of the things, or spheres of things, that go to make up the knower's world. These constitute the great dualism of inner and outer controls which, according to Baldwin, is for the knower characteristic of the logical mode of cognition as distinct from the pre-logical and the super-logical modes.

New distinctions and problems inevitably give rise to a terminology sometimes strange. The reader of the book has difficulties to overcome, and not all of these are due to novel terms. An unusual number of faulty grammatical constructions and typographical errors, suggesting hasty writing and inadequate proof-reading, make one pause and ponder.

"The logical operations as such, considered as the essential method of progress or advance in the mode of thought, proceed by experimentation, or . . . schematism" (p. 4). But while schematism and experimentation are the essential method of advance in thought, judgment proper does not appear until they have been passed. Like Mill, Baldwin limits logical thought and judgment proper to the sphere of relations of implication. Judgment is the finished embodiment of belief. On the last page of the book the singular, the subject and the schematic are mentioned as extralogical (p. 418). The general, the concrete and the logical are all retrospective, while schematism is always prospective. Contents are retrospective, intent and control are prospective.

Certain further fundamentals of the book may be grouped as follows: Two sorts of schematism, the recognitive or scientific and the selective or appreciative, are distinguished. Both are purposive, but the former alone must agree with facts and satisfy the theoretical or knowing interest. The latter is subject only to inner control, that is, the laws of reflection. Four kinds of interest are distinguished, namely, the "practical," the "pragmatic" (the practical interest considered from the outside or psychological point of view), the "theoretic" and the "pragmatelic" (interest

in the system of knowledge as satisfying, fulfilling, consequential, etc.). The two types of schematism are named, in the pre-logical mode, presumption and lower assumption, and in the logical mode, presupposition and higher assumption. A child presumes the existence of a toy for which it cries; it assumes a control when it tries to "feed" its doll. We presuppose the law of conservation in physics: we assume a control in the "illusion of the theater." This is an adaptation of Meinong's distinction between *Annahme* and *Voraussetzung*.

The subject matter of judgment, here as with Brentano, is a single whole which usually presupposes a sphere of control within which the truth of the judgment falls. "Adam Bede was a noble fellow," presupposes a sphere called fiction, for example. The existential judgment merely makes the presupposed control predicative (but not attributive). In ordinary judgment there is a relational content under presuppositions: in the existential, the presupposition is asserted (or denied). Baldwin rejects Bradley's view that reality is the ultimate subject of logical judgment, "for reality is predicate, not subject" (p. 16, note 3). Then follows the distinction between reality-feeling and belief first presented in the author's "Handbook of Psychology." The former is a consciousness of intent rather than content; it is a reference to some presupposed field of control when no lack, doubt, disturbance or embarrassment exists as to the content present in reflection. Belief arises only after such disturbance has been resolved by judgment into positive assertion or denial. Belief embodies intent as well as content and its intent is presupposition. The latter has become so conventional in all social intercourse that the intent of belief is seldom stirred up (p. 23). "Belief is the disposition to judge or acknowledge a thing as in some sense existing or real."

Limitations of space preclude any attempt to reproduce the argument of the book here. The first chapter is the introduction, devoted to the nature and presuppositions of experimental logic. Chapter two classifies and discusses judgments or logical meanings accord-

ing to the sort and amount of belief they embody, following Venn to some extent. Chapter three deals with what we might call the social character of knowledge—all judgment as such is syndoxic, *i. e.*, its meanings are not only held in common, but held as common. The discussion distinguishes between those judgments actually held in common and those fit or appropriate to be held in common—catholic and synnomic syndoxity. Genetically the latter develops out of the former. The social aspect of knowledge, truth and reality is nowhere treated with the thoroughness and emphasis of this chapter. “The individual is not a social unit, he is a social outcome.” “The private thought is not a cognitive unit, it is a cognitive outcome” (p. 105). And yet we have here an epistemology the main definitions and principles of which are molded by the presupposition that there is a plurality of minds face to face with a common but external world. That is, this is the knower’s presupposition. One is apt to get the impression, however, that it is the author’s—a presupposition which is very familiar to readers of eighteenth century philosophy. In the fourth chapter the problematical is defined as including the disjunctive and the contingent. The former has a definite control but expresses as yet indefinite internal relations in the content. The latter expresses definite internal relations of the content, but without a determined control. This chapter contains an interesting discussion of logical quantity. Chapter five deals especially with contingent meanings. The discussion of implication and postulation is here important. The development of logical meaning through predication and intercourse is taken up in chapter six. Chapter seven treats of the growth of logical meaning in terms. Elucidation and proposal, defined in chapter six, here appear as the “what” and the “why” of terms. Abstraction is discussed as selection based on individual dispositions and interests (p. 186). The author points out that the singular has, properly speaking, no extension. As prelogical it is purely appreciative. As logical, it is either “imported,” *i. e.*, selective, or “essential” and imposed by ex-

ternal control. The distinction between the concrete and the abstract is only another illustration of the two-faced character of all logical meanings, a character of which the recognitive and the selective, the retrospective and the prospective, the implied and the proposed, the conventional and the experimental, the static and the dynamic, are other illustrations. In chapter eight, the proposition is defined as “that mode of predication in which relation is individuated as a meaning” (p. 211), but the relation is expressed, not in the copula, but in the predicate (p. 263). The characters of propositions enumerated are six—quantity, telling how much; control-wise community, telling by whom; content-wise community, telling for whom; quality, telling what; relational character, telling why, and modality, telling where or in what sphere it holds. The distinction between the content-wise and control-wise characters of propositions is not new except in name. It is the habitual and reconstructive aspects of judgments over again. This chapter (VIII.) is chiefly devoted to quality, and of the two, to the negative. The motive of negation is not rejection, as some have held, but further determination or individuation by limitation. Chapter nine deals with the import and character of propositions. All propositions are both analytic and synthetic, *i. e.*, they all elucidate and propose. All judgments, whether affirmative or negative, intend existence and are existential (p. 256). Disbelief is a form of belief. The true opposite of belief is doubt. There must be a certain categorical force in any proposition that expresses judgment. Two great characters of propositions are fundamental: the one dynamic, synthetic, developmental, the character of wholes as such; the other static, analytic, the character of relations established within wholes (p. 272). The former is named “modality,” the latter, “relation.”

Chapters ten, eleven and twelve, part three of this volume, are devoted to the second of these two great characters, *i. e.*, to the theory of implication or logical validity. Implication is the internal organization in which the achievements of successive judgments have issued. Its most general characteristic is

"reasonableness," and the two elements of reasonableness are identity-difference and control, validity and truth. "Every implication is a subject-matter identical with itself, different from or exclusive of any other and, taken together with its contradictory, exhaustive of the sphere of control in which they are both found" (p. 283). There is no *a priori* law or form of identity above and beyond the individuation of the object of thought as such. Identity is of two sorts, inner and outer, internal and external. The latter is resolvable into recurrence and "secondary conversion"; as to the former or inner identity "we wait neither for recurrence nor do we ask our neighbors. We find in the immediately persisting and continuous mental life the experience that enables us to call the self identical" (p. 289). The present reviewer does not believe this to be true or psychological. Self-identity in the subject of experience is no more an immediate intuition than the identity of the solar system is and we arrive at the consciousness of the one by precisely the same dialectic steps as the other. Perhaps Baldwin here means, however, that self-identity *seems to the knower* to come by immediate intuition, but even this statement seems to us to be a case of reading one's own prejudices into the experience of other people.

Class identity and singular identity differ only as a group of different objects with the same meaning differ from a group of recurrences of the same object with the same meaning, and from the standpoint of community these are the same thing.

Identity in difference is prelogical; it becomes identity and difference when taken up into the logical mode by judgment. This process is called induction and issues in classification, ordination and definition. Hence the two guiding threads of induction, says Baldwin, are agreement and difference, giving rise to the two fundamental methods recognized by Herschel and Mill. The other methods of Mill are variations on these two. Baldwin's discussion of induction is weak for the following reasons: Mill's methods are methods of discovering sequences, and not coexistences—an oversight that has characterized inductive

logic ever since and one that characterizes this discussion. Again, they are methods of elimination and presuppose that nature is composed of manifold kinds and causal agents which have already been discovered and classified. These methods fail to describe the actual method of scientific procedure, because they assume that the objective content of judgment and the original data with which the judgment starts are one and the same thing.

Mill's methods are largely deductive rather than inductive, and the method by which Mill arrived at his canons of induction is deductive. They are deduced from an *a priori* conception of the objects of nature to be investigated. It will be evident, I think, that the method of induction outlined by Baldwin (pp. 304-7) is also deductive.

The resulting judgment is one of implication rather than one of proposal or schematism. The two great elements of validity are "universality of the necessary type" and the relation of dependence or ground. Such judgments are reached by establishing the synonomic force of judgments and the exhaustion of the class-meaning by limitation (p. 312). The former gives judgment its universality—its necessity—and the latter, its rational character as logical ground. The treatment of deduction is not only brief, it makes no attempt to show the intimate connection between deduction and experimentation in scientific procedure.

Chapters thirteen, fourteen and fifteen (part four of the book) are devoted to The Dualisms and Limitations of Thought. They are, for the most part, a discussion of pragmatism. They treat memory and thought as related alike to reality; each can be acted on because it is correct; it is false to say they are correct because they can be acted on. The criteria of correctness are conversion (or social control) and external control. Calling this view the theory of knowledge through control, Baldwin names the view of Dewey the theory of "control through knowledge." The latter is "the 'control' of the Studies in Logical Theory and other works of the Chicago school so-called." "It is control of a personal sort" (p. 349). Notwithstanding Baldwin's ex-

pressed hope (p. 349, note) that he has not misrepresented the doctrine of control of these writers, the present reviewer feels compelled to say he has misrepresented it by identifying it with his own doctrine of "inner" control!

The most characteristic feature of this volume, as of the previous one, is Baldwin's dualism of inner and outer controls. He holds, however, that the two controls exist only for the knower, "for consciousness" (p. 5, note), and only in the logical mode of thought. I suppose he intends to show that this dualism of controls is really phenomenal—in the third volume. Otherwise it is an important book and one that specialists in logical theory will welcome.

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BOTANICAL NOTES

DR. RUTH MARSHALL has given us an instructive pamphlet on the "Ferns of the Dells of the Wisconsin River," illustrated by halftone reproductions of photographs of the ferns themselves, and their rocky and often picturesque environment. A pleasantly and somewhat popularly written text adds to the interest of the pretty booklet.

FROM far-away Trinidad come three papers by J. B. Rorer on plant pathology—"Bud-rot of the Coconut Palm," "Black-rot and Canker of Cacao" and "A Bacterial Disease of Bananas and Plantains." The exact relationship of the organism in the latter case has not yet been made out.

DR. GROTH's paper on the "Structure of Tomato Skins" in the Bulletin of the New Jersey Experiment Station (No. 228) will interest histologists as well as those who are studying the structural differences between closely related plants.

WILLIAM BEUTENMÜLLER's recent contributions (*Bull. Am. Museum of Nat. Hist.*, vol. 28) on certain gall-producing insects is of interest to botanists as well as entomologists, since the galls themselves are strictly botanical. Excellent illustrations accompany the papers.

PROFESSOR PHILLIPS contributes materially to our knowledge of the life history of the junipers in his paper on "The Dissemination

of Junipers by Birds" (*Forestry Quarterly*, vol. 8) in which he gives facts from which he reaches the conclusion that "birds are responsible for most of the dissemination of junipers," and that "mammals distribute only a small proportion of juniper seeds."

A PAPER on "Reforestation Operations" in the fifteenth Annual Report of the New York Forest, Fish and Game Commission, by E. R. Pettis, is full of helpful suggestions for all who are interested in this phase of the general subject of forestry. It is illustrated by many fine half-tone reproductions of photographs.

THE Report of the State Botanist (of the New York State Museum) for the year 1909, contains the usual lists of species not before reported (including no less than 38 flowering plants): some discussions of certain species; notes on certain species of edible fungi; new species from outside the state of New York; a monograph of New York species of *Inocybe*, and a similar treatment of the species of *Hebeloma*. Ten good colored plates accompany the report.

PROFESSOR C. E. LEWIS describes (*Bull. Maine Expt. Station*, No. 178) a new species of *Endomyces* (*E. mali*) which he discovered in a study of apple decay. Cultural and cytological comparisons are made with other species, and the paper is illustrated with drawings and half-tones of photographs.

IN another bulletin (No. 174) of the same station Professor W. J. Morse describes a stem and tuber disease of the potato which has assumed "rather grave aspects" and to which the name "blackleg" has been given. It is widespread in the United States from South Carolina to Maine, and westward to Colorado, and possibly further west, although often found only in isolated localities. It has not yet been determined whether or not the bacteria are identical with any hitherto described. It is probably spread by means of infected seed tubers.

ORMOND BUTLER's "Observations on the California Vine Disease" (*Mem. Torr. Bot. Club*, XIV., 2) lead him to the conclusion that it "is due to some weakness in the functions of absorption and translocation of water